

A LINDEN (TILIA) FOREST ON CAPE COD
(WITH EXTENDED NOTES ON TILIA NEGLECTA,
BROMUS PUBESCENS, AND RIBES HIRTELLUM).

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An extensive area of dunes, known as Sandy Neck, extends for some six miles along the north side of the Cape in the town of Barnstable. It lies between the ocean and the Great Marshes, one of the largest salt marshes in Massachusetts. About halfway down the neck and within the dunes is a swamp hollow with red maples, bordered on its southern bank by a little forest of native linden or basswood trees (*Tilia neglecta*). There are about a dozen clumps, interspersed among other trees. On the ground is a lush spring growth, a foot or two high, consisting of the grass *Festuca obtusa*, columbine (*Aquilegia canadensis*), *Geranium maculatum*, *Smilacina stellata*, *Aralia quinquefolia*, and *Thalictrum revolutum*. Less abundant are *Smilacina racemosa*, meadow rue (*Thalictrum polygamum*), and *Circaea quadrisulcata*. It is reminiscent of the dense herbaceous undergrowth of the Potomac River flats above Washington, but lacks the numerous kinds of violets on those flats. Vines of the small-fruited summer grape (*Vitis aestivalis*) climb high in the trees, but only one vine was seen in fruit, and that far up out of reach.

Some of the ancient maples in the swamp are uprooted and fallen. There are a few willow trees (*Salix Bebbiana*) and a single bush of *Salix cordata*. The middle is practically bare except for dead leaves, the depression extending to a width of about 500 feet. A few bushes of *Ilex verticillata*, with unusually long leaves and solitary fruit, extend into the open area; there are mats of marsh fern and *Lycopus uniflorus* and a few dwarf cinnamon ferns, but no trace of the Massachusetts fern (*Thelypteris simulata*), abundant in maple swamps at Osterville on the south side of the Cape. Toward the margin are some isolated clumps of sedges and rushes, including *Carex seorsa*, *C. intumescens*,

Juncus effusus var. *solutus*, *J. canadensis*, and *J. tenuis* with extremely narrow leaves.

The north-facing bank, some thirty feet high, is the most interesting area. It has the *Tilia* trees. At the lowest level are marginal and spinulose shield ferns, and some polypody fern. On this bank are sedges, *Carex Swanii*, *C. debilis* var. *Rudgei*, *C. Emmonsii*, and *C. blanda*, the last-named previously known only from Osterville at a locality I cannot find. Toward the entrance to the swamp are a few sparse plants of *Bromus pubescens*, a grass new to southeastern Massachusetts. Of general occurrence are *Trientalis* and Canada mayflower and poison ivy, also common trees of the Cape: black and white oak, tupelo, holly, sassafras, and pitch pines. Witch hazel (*Hammelis*), scattered flowering dogwood trees (none producing flowers), and the viburnum which passes as *V. venosum* are on the moister parts. The only introduced plant appears to be *Veronica arvensis*, which grows sparingly in little openings.

The linden trees are 35 to 60 feet high, each with several trunks 6 to 18 inches in diameter radiating from ground level. Only one clump was flowering. They are *Tilia neglecta*, whatever that name may represent. Spach, in Ann. Sc. Nat. ser. II. ii: (1834) pl. 15, gave a detailed account of European and American lindens, including small figures of flower and fruit. *Tilia neglecta* came from "ambulacris Horti Parisiensis" and flowered at the same time as *T. nigra* Borkhausen, *Forstbot.* 2: 1220 (1803) (synonym of *T. americana* L.), which it resembled in stature, leaves, flowers, and bracts. Spach described the petals as "pallida lutea", and the leaf as "subtus puberula". Fernald, in RHODORA 43: 604-607 (1941), in a review of *Tilia*, said that few collections of *T. neglecta* could be closely matched, that leaves were green or merely grayish beneath with loosely scattered stellate hairs and simple pilosity, and that the series was close to *T. americana*.

In *Castanea* 20: 58 (1955), under the new name *T. americana* var. *neglecta*, Fosberg stated that the difference lies in purple twigs and slightly stellulate-pubescent and more

or less glaucous under surfaces of the leaves." He remarks that Little (1953) "has reduced *T. neglecta* outright to *T. americana*, but this seems too drastic." Little was not being drastic; he used a question mark; he was just being careful.

Now there are varietal synonyms that antedate var. *neglecta*. For example, *T. nigra vestita* A. Br. is listed by Rehder, *Man. Cult. Trees and Shrubs*, ed. 2: 625 (1940), derived from *T. nigra* β A. Braun in Döll, *Rhein Flora*, p. 674 (1843). By the Austrian J. N. Bayer, in *Verhand. Zool.-bot. Ges. Wien* 12: (1862) t. VIII, f. 4, *Tilia neglecta* was illustrated from a Spach specimen, showing leaf, foliar bract, and buds; *T. nigra* β was said to be sparingly stellate-pubescent below, cited as coming from Kentucky and cultivated in Europe. It became *T. americana* var. *vestita* (A. Br.) Victor Engler, *Monographie der Gattung Tilia*, Breslau (1909) p. 41. Engler described many forms and varieties, but was not too sure of var. *vestita*, separated with difficulty from the putative hybrid *T. americana* \times *heterophylla*. This hybrid, he says, is questionably *T. Michauxii* Nuttall, in which pubescence of the lower leaf surface is greatly reduced. All of which goes to show that the European botanists knew no more about the subject than the American botanists did. Another varietal name to contend with is *T. americana* β *pubescens* Dippel, *Handb. Laubholzkunde* 3: 63 (1893). It was described as having "foliis subtus pilis stellatis \pm pubescentes, interdum suborbiculata", and cited from Kentucky (*Short*), Pennsylvania (*Gray!*), and Stony Man Mt., Virginia (*Steele* no. 78).

Differences between *T. americana*, *T. heterophylla*, and *T. neglecta* are pretty weak (cf. Rehder, p. 622). In publishing *T. glabra* var. *neglecta*, Bush in *Bull Torr. Cl.* 54: 235 (1927), thought it might be only a form with straight simple firmly-attached pubescence. He cited specimens from coastal Connecticut (Guilford, July and Aug. 1921, *Trelease*). Sargent gave the range of *T. neglecta* (in *Man.* p. 733) as from Montreal to the coast of Massachusetts and New York, through the middle states to the valley of the Potomac River, then west and south. Rehder, the best de-

heterophyllia		neglecta					americana						
Leaf													
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scriber, says leaves are "greenish or grayish and loosely stellate-pubescent beneath, with scattered mostly simple hairs on the veins, often tinged brownish; petals pale yellow and 8 mm. long."

At Sandy Neck the leaves are lightly pubescent below, of firm straight hairs mixed with easily dislodged 2-4-branched flattened hairs. Bud scales and pedicels are moderately stellate (see fig. 2). The flowers are light brown and strong-smelling, and the petals reach 8×3 mm, about the size in Spach's figures.

In eastern Massachusetts *Tilia neglecta* appears as a tree of salt marsh islands or associated shores, recorded in the herbarium of the The New England Botanical Club from Mass.: Carr's Island in salt marsh, Newburyport, *Bean, Macgregor & Knowlton* in 1945; abundant in seashore thicket, Hingham, *Knowlton* in 1943 (ripe fruit); Sampson's Island, Orleans, *Murdoch* in 1913 (no flowers or fruit;

Fig. 1. *Tilia* hair types: lower leaf surface, pedicel, and sepal. Boiled fragments, 1-5 mm in diameter, placed on slide in small drop of glue. Hairs removed with needle; some transferred to 0.5 mm-grid eyepiece on slide.

T. heterophylla, Osterville, July 19, 1969 (no. 2526). Hairs in felt-like flattened layers, 120 on 1 sq. mm, mostly 8-pronged; some unbranched (see fig.). Stellate hairs of petiole and flower bracts in a dense felt-like layer.

T. neglecta, Sandy Neck, July 4, 1969 (no. 2480). Count of flat hairs in a dense area 5 mm square of lower leaf surface: 4-pronged 110 (15%); 3-pronged 30 (5%); 2-pronged 30 (5%); 5-pronged very rare; erect type, unbranched, firmly attached to minute veins, 500 (75%); all these hairs hyaline. Axillary tufts of fascicular hairs: commonly 0.5-0.6 mm long, thickened and brownish. Pedicel: 20 scattered hyaline hairs on 1 sq. mm, chiefly 8-pronged; some fascicled and erect. Sepal: as on pedicel, but dense and felt-like; some erect and sinuous. On flower bract (not shown): small sparse 6-pronged on axial face, larger and 4-6-pronged on abaxial face. Minute scattered reddish glands are along veins on both surfaces of leaf.

T. americana, Milton, July 9, 1969 (no. 3492). Axillary fascicular hairs as in *T. heterophylla*. Pedicel: 20 scattered flat, mostly 8-pronged hairs of varied size. On midrib of leaf bract: some widely scattered flat hairs, mostly 8-pronged. (not shown). On larger veins a few scattered simple hairs (not shown).

noted as the only tree on the island). Conn.: "a large old tree near the coast", leaves and bark collected by Mrs. E. G. Hart. In addition to these citations, I find an old wind-blown tree without flowers or fruit at the entrance (salt marsh) to Dowse's Point, Osterville. I fail to find Fernald and Long's tree "about 7 feet high in 1918" at the mouth of Red River, Harwich, which has leaves loosely matted-stellate below and is maintained as *T. heterophylla* by Fernald and as *T. neglecta* by Sargent. As to other lindens on Cape Cod, there is a flowering tree of *T. heterophylla* on abandoned land on Tower Hill Road, Osterville (no. 2526). It has fragrant pale yellow flowers and thick-felted indumentum on the lower leaf surface. Nearby is a tangle of *Populus alba*, high-climbing *Celastrus orbiculata*, and bushes of honeysuckle (*Lonicera Morrowii*), three of the commonest introduced and escaped woody species on Cape Cod. *T. americana* is frequently planted; *T. europaea* is an abundant escape from cultivation. The Sandy Neck trees are in an isolated place, and possibility of hybridization is remote. I have treated only the fringe of the problem, the great complexity of which lies in the southern Appalachians.

We now come to the brome grass. *Bromus pubescens* Muhl. occurs sparingly (only two flowering stems observed) along with *Triosteum*, *Galium circaezans*, and *G. triflorum*. In no. 2481 (July 4, 1969) the leaves are more or less pubescent and sheaths glabrous. In no. 2541 (July 20, 1969) the lowest sheath is pubescent. The flange at leaf apex is in both collections about 1 mm long.

The name *B. pubescens* is taken up with some misgivings, in conformity with Wagnon's treatment in RHODORA 52: 211-215 (1950), but I wonder if other specimens could be found in the Linnaean herbaria at Stockholm or Uppsala, (cf. Stearn's *Species Plantarum* Facsimile, pp. 104, 107, and 114 (1957), which might modify the indefiniteness of the Linnaean Herbarium in London. Comparative distinctions were not drawn as finely in 1753 as at the present, and as Stearn (p. 160) says, "The lens had not become the indispensable tool of systematists in Linnaeus' day and the

metric system of measurements had yet to be invented". It is interesting to note that in vol. 2. p. 72, sketches of *Bromus mollis*, *B. lepidus*, and *B. squarrosus* made by Linnaeus are reproduced. These may provide insight on his ideas of the genus. *Bromus purgans* and *B. ciliatus* were actually described in *Species Plantarum*, and this procedure together with the new specific names, is probably associated with the relatively late acquisition of Kalm's material. There has been a good deal of controversy about *B. purgans* and *B. pubescens*. Fernald (*Man.* p. 72) says the name "purgans" was given because Linnaeus erroneously identified the plant with "Gramen bromoides catharticum" of Feuillée. Linnaeus did not do this; he merely cited the Peruvian Feuillée figure as questionable.

We now come to the status of the Sandy Neck material. I could not find the collection cited as *B. latiglumis* (*Rhodora* 49: 258 (1947), and Seymour in "*Flora of New England*" (1969) does not mention it. *B. pubescens* (*B. purgans*, *Man.* ed. 8) is known sparingly from the Boston area, but becomes common westward, and was originally described by Pursh from Nuttall's collection on the banks of the Missouri River. It was seen by Pursh growing 5 to 8 feet high in Lambert's garden at Boyton, England. Asa Gray records an amusing visit to Lambert (*Letters*, vol. 1, p. 111 (1893), "the queerest old mortal I ever set eyes on". Lambert's herbarium was broken up and sold, with consequent disappearance of many of Pursh's plants. The switch of names by Wagnon is perhaps the best solution for stability, since *B. latiglumis* (Shear) Hitchcock appears to be untenable. It was a substitute for *B. altissimus* Pursh (1814), not Gilibert (1792). But McVaugh, *Gentes Herbarum* 8, fasc. 1 (1941) and others consider as invalid the names published in Gilibert's excessively rare "*Excercitia Phytologia*" (1792).

The Sandy Neck material (cf. *B. purgans*, *Rhodora* 43: pl. 670 (1941) has only a slight flange at the sheath apex, as in fig. 8. Branching of the panicle and the leaves resemble *B. nottowayanus* (fig. 1) from eastern Virginia,

which along with *B. latifolius* is included by Radford, Ahles, and Bell under *B. purgans* in "Manual of the Vascular Flora of the Carolinas", and the name *B. purgans* var. *latiglumis* Shear shows some question as to the diversity of the two plants under discussion. Is our Cape Cod plant possibly a northern extension of the southern coastal-plain *Bromus nottowayanus*? One interesting thing which Wagon could not explain is the Linnaean use of the term "crispa" in reference to the panicle of *B. purgans* and *B. ciliata*. In *Philosophia Botanica* (1751) it refers only to leaf margins. In going through the grasses of *Species Plantarum*, I find only two other references: *Poa alpina* var. β and *Poa bulbosa*, and I suspect the term refers to large pulvini or similar structures. It came from Scheuchzer, the great forerunner on Linnaeus in sedges and grasses.

Bromus pubescens is cited by Seymour as "uncommon; dry open commonly rocky woods in basic soil", and in Massachusetts south to Norfolk County. It is one of the plants listed from Oak Island, Revere, formerly the most interesting salt-marsh island of the Massachusetts coast (cf. the interesting account by W. P. Rich in RHODORA 4: 87-94 (1902). Probably nothing of botanical interest remains.

Festuca obtusa Biehler. Known previously from Cape Cod only at Sandwich and Brewster and there sparingly.

Carex seorsa Howe. Known previously from Monomoy (*Weatherby* in 1914), but it abounds in the maple swamp in the Lowell Reservation on Mashpee Pond, and Fogg cites it from Nonamesset (Elizabeth Islands. It is occasional in the Boston area south to Norton in Bristol County, and I have recently found it in Plymouth County at Plympton.

Carex blanda Dewey. Occasional to frequent in the Boston area, south to localities in Bristol County, and known from Nonamesset. At Osterville it was collected in "wet woods" by Fernald and Hunnewell in 1916. The plant is by no means smooth, as the name might imply, and the minutely serrate upper sheath apex is a good means of identification.

Carex intumescens Rudge. The perigynia are 14×6 mm; achenes average 5.0×3.1 mm and are not rounded at the apex. The plant is therefore typical southern *C. intumescens*.

Cardamine parviflora L. var. **arenicola** (Britt.) O. E. Schulz. A small white-flowered cress, known previously from sandy woods in Bourne, Saconesset (W. Falmouth), and Provincetown.

Aquilegia canadensis L. Fairly abundant and probably dependent on lime content of shells. It is known from scattered plants in Falmouth, Mashpee, and Osterville. Fogg in *RHODORA* 32: 176 (1930) cites it as one of the species on the morainal hills of the Upper Cape. It is not known from the Elizabeth Islands. "The superficial aspect of this part of the Cape is that generally associated with the Alleghenian flora with a slight tinge of the Canadian. This impression is borne out by a study of the plants which occur here, many of which are entirely lacking, or only locally known elsewhere on the Cape. There are well over 150 such plants."

Ribes hirtellum Michx. var. **calcicola** Fernald. In *RHODORA* 72: (1970), I described the seeds. On Sandy Neck only a single flower was seen on this prickly little bush, associated here with *Triosteum* and *Galium*. It is obviously out of its environment, which is at the borders of brackish inlets, though recently I found it in a meadow in Sandwich with *Habenaria psycodes*. The Cape Cod plant has been somewhat questionably treated as true var. *calcicola*. The type was *Ribes oxyacanthoides* var. *calcicola* in *RHODORA* 7: 155 (1905), which came from arbor-vitae swamps at the mouth of the Bonaventure River in Quebec, and characterized by leaves softly pubescent beneath. Inland it grows chiefly in wet calcareous soils, as noted by Wiegand and Eames in "*Flora of the Cayuga Lake Basin*" (1926), McVaugh in "*Flora of Columbia County Area, New York*" (1958), and Deam "*Flora of Indiana*" (1940). A detailed account was given by Fernald in "*The Varieties of Ribes hirtellum*", *RHODORA* 13: 73-76 (1911). Perhaps the best

treatment is Alwin Berger's in N.Y. State Agric. Expt. Sta. (Geneva) Tech. Bull. no. 109 (1924) which says that in *Grossularia hirtella* the leaves of the short lateral shoots are more reniform or orbicular and with a subcordate base; the petals half as long as the sepals, and white, obovate, or with pink nervation; stamens about as long as the sepals. It has been the source of many cultivated strains of gooseberries. Gleason, *Ill. Fl.* 2: 277 (1963) thinks the distinction between *R. hirtellus* and *R. oxyacanthoides* scarcely warrants specific segregation, since intermediate forms with bracts both villous and glandular-ciliate exist.

The Cape Cod specimens show great variance with the generally accepted characteristics. The leaves are villous below, and vary from cuneate to cordate at the base. Flowers are 2 or 3 on a peduncle. Filaments are commonly 6 mm long and exceed the sepals in mature flowers by 1 to 1.5 mm. Sepals are oblong, green, sometimes purple-tinged, obtuse, commonly hirtellous, 3.5-4 × 2 mm. Petals are scarious white, 2.5 mm long, truncate erose at summit and narrowed to the base; styles usually about equalling the sepals, parted 1.5 mm from the base, and lanuginous for half the length. Glands are common on the apices of the branched petiolar trichomes, and sparingly on petioles, bud scales and bract margins. In addition to strong nodular spines, there are usually numerous reflexed prickles 2-7 mm long on the loose white bark of branches. Perhaps Fernald was closer to the mark when he originally described the plant as *R. oxyacanthoides* var. *calcicola*. The Cape Cod material is fairly homogeneous in the characteristics noted. The following collections are cited: among clumps of *Carex prairea*, at head of tide, Bumps River, Osterville (no. 2004, in flower May 27, 1967); dry bank just above tide level, Mashpee River, Mashpee (no. 2242, in flower May 10, 1969); swamps near old tide level, East Sandwich (no. 1988, in flower May 23, 1967).

Rubus Enslenii Tratt. A trailing blackberry with solitary fruits (det. A. R. Hodgdon). He notes that "it is usually found in oak-hickory woods, and is a relatively southern

species of deciduous woodlands." In their treatment of "Rubus in New England", RHODORA 68: 491 (1966) Hodgdon and Steele cite it from Harwich.

Rubus pensilvanicus Poir. (det. A. R. Hodgdon). A blackberry with tall erect canes "often looking like the common *R. allegheniensis*, but without the characteristic glands amongst the pubescence of the inflorescence". It is cited from Sandwich and Falmouth. *R. allegheniensis* is cited by Hodgdon and Steele from Falmouth and Martha's Vineyard.

Agrimonia gryposepala Wallr. Common in the Boston area. Known from Lakeville and Rochester in Plymouth County; and occasional in richer woodlands on Cape Cod in Pocasset, Falmouth, Centerville, and East Sandwich.

Galium triflorum Michx. The leaves are six at a node, but stems vary from smooth to slightly scabrous. The plants are not sweet-scented. Known from Harwich, East Brewster, and Provincetown.

Galium circaezans Michx. var. **hypomalicum** Fernald. Common in northern New England, and extending southward into Bristol County. On Cape Cod it is known from West Barnstable and Provincetown; there are only a few plants at Sandy Neck.

Triosteum aurantiacum Bicknell. The horse-gentian is occasional around Boston and extends south to Plymouth. On Cape Cod it is known from Bourne and Sandwich. Along the Sandwich Beach Road I find it growing with dog's-tooth violet (*Erythronium americanum*), which is here in great abundance, and is the only locality known on Cape Cod. At one time there were scattered plants of *Claytonia virginica*, otherwise not known as native to eastern Massachusetts. Miss Eda M. Roos, of East Sandwich, informs me that at the turn of the century botany classes from Sandwich High School used to go to Town Neck to see these plants. Mr. Weatherby went with her in 1932 to the locality; he collected *Erythronium* but they found no *Claytonia*. The next year Miss Roos sent me a single specimen, now in the Gray Herbarium.

In the *Tilia* woods on Sandy Neck the *Compositae* are disappointing, only *Aster divaricatus* and *Solidago caesia* were noted, both of them widespread on Cape Cod. I shall give an extended account of the *Amelanchier* and *Viburnum* shortly. Since Sandy Neck is part of the Barnstable town lands, it is protected. The little saltmarsh islands along the Massachusetts coast should be searched for *Tilia* and associated plants, and be preserved before they, too, suffer the fate of Oak Island. Some specimens have been placed in the Cape Cod Museum of Natural History and the New England Botanical Club.

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After writing this report, I talked with County Commissioner Heyworth Backus. He vaguely remembered a family living at the site, but said we should go to see Martha Dickie, of West Barnstable, who knew all about Sandy Neck. She has a good collection of arrowheads, pestles, and axes from Sandy Neck, and mentioned the skeleton of an Indian chief, found buried there. Also, long after the Indians were gone a socially unambitious family took up quarters. They had a dull-witted daughter. She had a suitor who was not so bright. She said she did not have money for a marriage licence. "That's all right", said the suitor, "I'll write up a licence, and we'll take it to the county clerk, and he'll sign it, and it won't cost anything". So he wrote up the licence on a sheet of paper. It was not a success. Both were committed to an institution for the feeble-minded. It is unlikely that this family or the Indians would have planted linden trees in a remote corner of the swamp, and we have already seen that native linden trees are scattered along the Massachusetts coast.

Since I wrote this footnote I have seen Spach's specimens of *Tilia neglecta* at Paris, and *Bromus purgans* in the Linnaean Herbarium in London. They will be commented upon later.